INSTRUCTIONS

CONNECTING RODS AND CONNECTING ROD BEARINGS

GE DIESEL ENGINES

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CONNECTING ROD BEARINGS

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CONNECTING RODS

DESCRIPTION (See Fig. 1)

Each connecting rod assembly includes two rods. The master rod is installed in the left bank of the engine. The art (articulated) rod, linked to the master rod by a pin connection, operates in the right bank. The connecting rods are precision machined and may be installed at any location or interchanged between engines, so long as they are placed in the correct bank of the engine.

The master and art rods are each stamped with various numbers related to their manufacture. Included in these numbers is a serial number which identifies the rod. The master rod and its cap are matched parts, each having identical serial numbers.

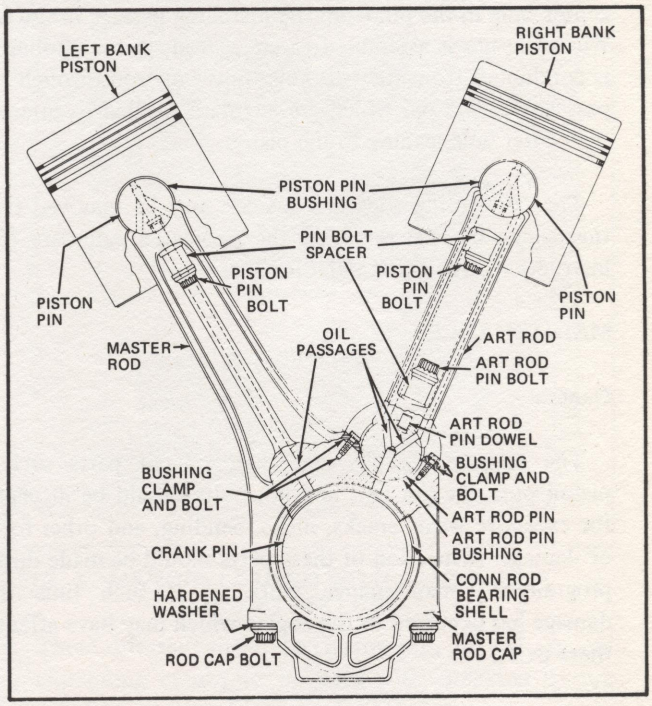

LEFT BANK PISTON
RIGHT BANK PISTON
PISTON PIN BUSHING
PIN BOLT SPACER
PISTON PIN BOLT
PISTON PIN BOLT
PISTON PIN
PISTON PIN
OIL PASSAGES
MASTER ROD
ART ROD
ART ROD PIN BOLT
ART ROD PIN DOWEL
BUSHING CLAMP AND BOLT
BUSHING CLAMP AND BOLT
ART ROD PIN
ART ROD PIN BUSHING
CRANK PIN
CONN ROD BEARING SHELL
HARDENED WASHER
MASTER ROD CAP
ROD CAP BOLT

FIG. 1. CONNECTING ROD ASSEMBLY, VIEWED FROM GENERATOR END OF ENGINE (CURRENT STYLE).

FIG. 1, E-16115A

The rods are forged steel to provide maximum strength. The art rod pin and the piston pins are saddle-mounted to the rods and are secured by high-strength bolts and pin bolt spacers. The spherical end of the spacer must be applied to the spherical seat on the rod. The art rod pin operates in a steel-backed bronze bushing in the master rod. The precision bearing shells, Fig. 16, are positioned both laterally and rotationally in the master rod and cap by locating tabs. They are secured firmly in place by the doweled bearing cap which is held on by bolts and hardened washers.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

Verify numbers for parts, tools, or material by using the Renewal Parts or Tool Catalogs, or contact your General Electric representative for assistance. Do not order from this publication.

GENERAL ELECTRIC

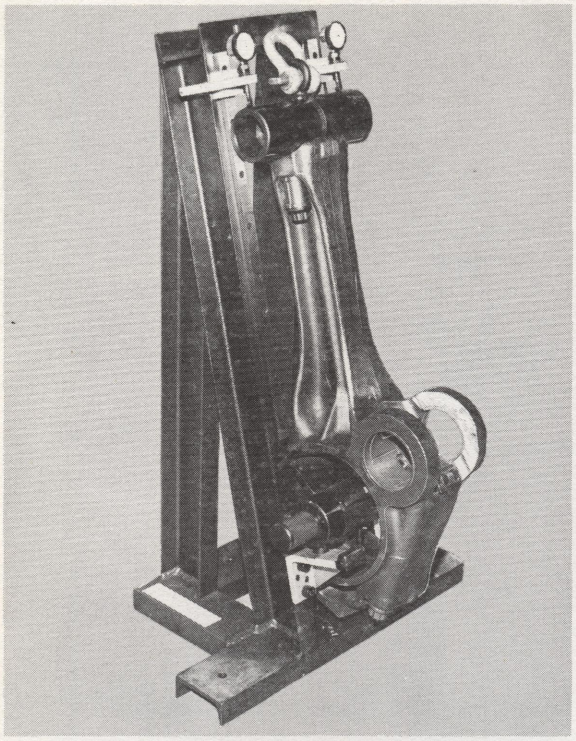


FIG. 4. CHECKING PARALLELISM BETWEEN PISTON PIN AND EXPANDED CRANK MANDRELS (DIAL INDICATOR ZEROED).

FIG. 4, E-18846

Carefully place the master rod into the checking fixture, positioning the crank mandrel against the support assembly and indicating rail on each side. See Figs. 4 and 5. Zero the dial indicators. Remove the rod, turn it 180 degrees, and reinstall. See Fig. 5. Dial indicators will again indicate zero if there is no sidewise bending and the two mandrels are parallel. See DATA section for limits if a zero reading is not obtained; use the sum of the two readings, one positive and one negative.

NOTE: *Position the barrel-shaped indicator contacts vertically on the mandrel, and be sure to allow at least one revolution of the needle before locking it at zero. After reinstalling the rod in the fixture, be sure the indicator contacts are again vertical before taking the reading.*

2. Check for twist by using a feeler gage, and indicate the clearance between the indicating rail and the piston pin mandrel. See DATA section for limits. Remove the rod, turn 180 degress, and recheck.

NOTE: *Performing the twist measurement in conjunction with the parallel measurement in Step 1 will require turning the rod 180 degress only once.*

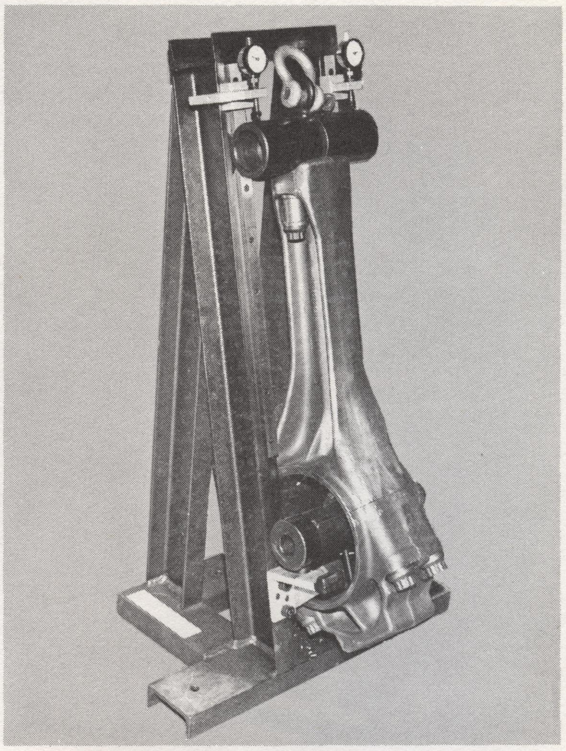


FIG. 5. CHECKING PARALLELISM BETWEEN PISTON PIN AND EXPANDED CRANK MANDRELS (ROD TURNED 180 DEGREES).

FIG. 5, E-18847

3. Perform Steps 1 and 2 with the piston pin mandrel removed and the art rod pin mandrel installed, checking parallel and twist on the art rod pin. See Fig. 6. Refer to DATA section for limits.

NOTE: *For a given rod, a condition of sidewise bending is usually accompanied by a condition of twist, and vice versa.*

Measuring Connecting Rod Bearing Bore

Verify all parts are clean and mating surfaces of the rod and cap are free of nicks or burrs. If any are found, use a fine mill file to remove them. Assemble the master rod cap in place, and tighten the cap nuts or cap bolts to the recommended torque.

Using an accurate inside micrometer, determine the average of three readings taken normal to the split line and 1-1/2 in. each side of the split line and taken approximately 3/4 in. from face of rod. Take readings at both ends of rod. See DATA section. If the diameter or out-of-roundness of the bore exceeds the limits given, the rod should be discarded or repaired.

FIG. 6, E-18848

FIG. 7, E-13395

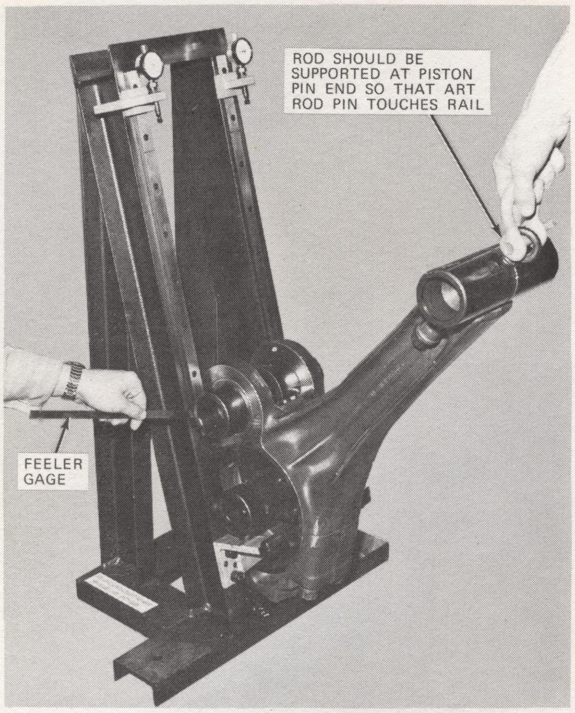

ROD SHOULD BE SUPPORTED AT PISTON PIN END SO THAT ART ROD PIN TOUCHES RAIL
FEELER GAGE

FIG. 6. CHECKING ART ROD PIN FOR TWIST.

Measuring Art Rod Pin Clearance

Using a new art rod pin and a 1/2-in. wide feeler gage of suitable thickness, place the gage 2 in. into the end of the bushing, then slide the pin in over the gage. The existing clearance will be indicated when a slight drag is required to remove the feeler gage. Check the other end of the bushing in the same manner. See DATA section for clearance limits. If the clearance exceeds the limits given, the bushing should be renewed. See "Renewing Art Rod Pin Bushing" section.

Renewing Art Rod Pin Bushing

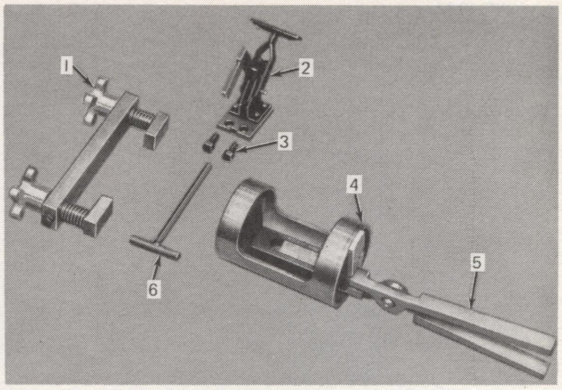
At present, two different types of art rod pin bushings and art rod pins are in service. They are:

Type 1. An axial grooved bushing used with a plain (grooveless) pin.

Type 2. A bushing without axial grooves and a pin with grooves.

Bushings and pins, with grooves, which are in satisfactory condition for reuse, may be installed together.

CAUTION: *Never use the plain bushing with the plain pin.*



REF.	DESCRIPTION
1	BUSHING STOP-BAR CLAMP
2	BUSHING ALIGNMENT FIXTURE
3	FIXTURE MOUNTING SCREWS
4	ART ROD PIN BUSHING
5	BUSHING INSERTING TOOL
6	WRENCH – 5/16 IN. HEX

FIG. 7. VIEW OF ART ROD PIN BUSHING AND INSTALLATION TOOLS.

To renew the art rod pin bushing, proceed as follows:

1. Remove the bushing clamp bolts. See Figs. 7 and 8.

2. To remove the worn bushings, carefully cut a groove full width across the face of the bushing in the area of the bails. The groove must be deep enough to relieve the bushing so that it can be easily pushed out of the bore, but MUST NOT be allowed to nick the rod.

CAUTION: *Do not attempt to press the bushing out without first relieving it. To do so will result in distortion of the bushing bore in the master rod.*

3. Thoroughly clean the bore and remove any nicks or burrs by using a fine mill file or emery cloth.

4. To install the new bushings with the prescribed interference fit, the bushings must be cooled and the rods heated.

WARNING: *To prevent personal injury, wear protective gloves when handling either hot or super-cooled parts.*

CAUTION: *Do not attempt to press the bushings into the rods without the prescribed temperature difference. To do so will result in distortion of the bushing and the bore in the master rod.*

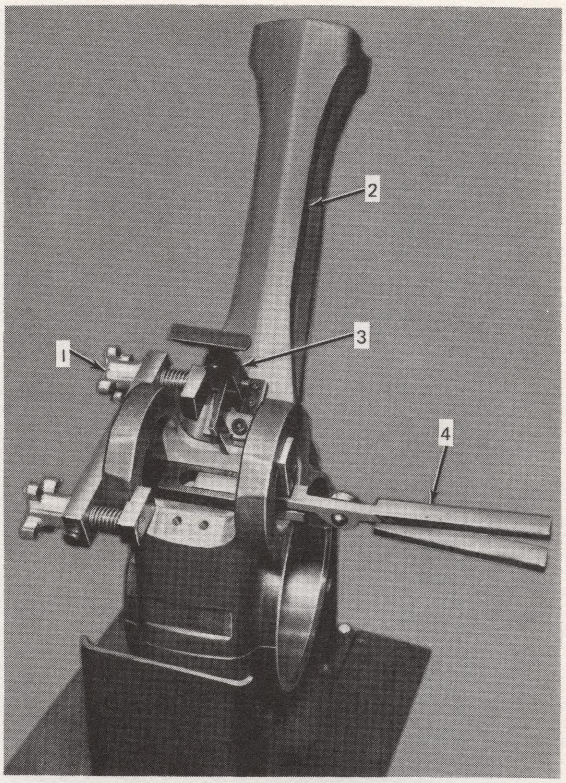
Heat the master rod to 250-275 F (121-135 C) in a temperature-controlled oven. Rods with tin-plated thrust surfaces must be wrapped with heavy asbestos paper to protect the plating against melting as a result of direct radiant heat.

Clean the bushing and cool it to −130 F (−90 C), using liquid nitrogen, dry ice, or a mechanical refrigerating unit. If dry ice or a mechanical refrigerating unit is used, cool the bushings for at least 1-1/2 hours.

5. Install the bushing stop-bar clamp and the bushing alignment fixture to the heated master rod. See Figs. 7 and 8.
6. Using the bushing inserting tool, quickly insert the cooled bushing into the bore of the master rod.

CAUTION: *It is possible to install the bushing incorrectly. Improper installation will result in partial restriction of the oil flow and damage to the power assembly during operation. The bushing must be installed so that the oil hole in the rod bore is located at the end of the elongated oil hole in the bushing when the edges of the window in the bushing are aligned with the opening in the rod. See Fig. 9.*

7. Remove the bushing stop-bar clamp and the bushing alignment fixture.
8. File the outer edge of the bushing window flush with the window in the master rod. Remove any sharp edges at the inside diameter of the bushing.
9. Position the bushing clamps and secure with cap screws and locking plates. Torque the cap screws to the required value (see DATA section), and bend tabs of new locking plates to secure screw heads.
10. Measure the pin-to-bushing clearance as previously described under "Measuring Art Rod Pin Clearance" section.



REF.	DESCRIPTION
1	BUSHING STOP-BAR CLAMP
2	MASTER ROD
3	BUSHING ALIGNMENT FIXTURE
4	BUSHING INSERTING TOOL

FIG. 8. VIEW OF ART ROD PIN BUSHING INSTALLATION TOOLS IN PLACE ON THE MASTER ROD.

FIG. 8, E-13396

Checking Art Rod Alignment

The art rods are checked for parallel and twist in the same general manner as was used to check the master rod. See Fig. 10. Install the piston pin mandrel and the art rod pin mandrel to the art rod. Tighten piston pin bolts to 250 lb.-ft. of torque; tighten art rod bolts to 375 lb.-ft. of torque. Perform Steps 1 and 2 under "Checking Master Rod Alignment." Refer to the DATA section for limits.

Repair of Connecting Rods

Connecting rods which are found to exceed the limits given in the DATA section for parallel and twist but which

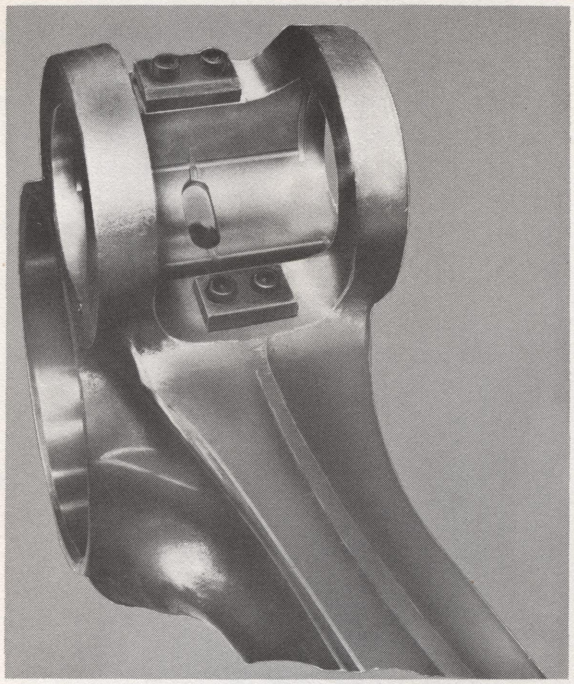


FIG. 9. ART ROD PIN BUSHING INSTALLED, SHOWING CORRECT LOCATION OF OIL SUPPLY PORT AND CLAMPING ARRANGEMENT.

FIG. 9, E-13099A

are otherwise sound (free from cracks and have not been overheated) may, in effect, be repaired by mounting them in a special fixture and regrinding their piston pin ends to the fit and finish shown in Fig. 18. It is strongly recommended that rods be returned to the factory for regrinding. However, if the grinding required will shorten the rod more than the limits given in the DATA section, the rod should be discarded.

As an aid in determining whether a rod is long enough to be repaired, a go/no-go gage, similar to one of those shown in Fig. 11, can be inserted between the mandrels while the rod is still in the checking fixture. If the gage will fit between the mandrels, the rod is long enough to be repaired. If the gage will not fit, the rod must be scrapped.

NOTE: *It is possible that a small percentage of rods which pass the go/no-go test may have an excessive condition of twist that is not repairable.*

Fabricate the gages as described below:

1. The gages should be made of 1/4-in. gage stock, finish-hardened to 52-56 Rockwell C.

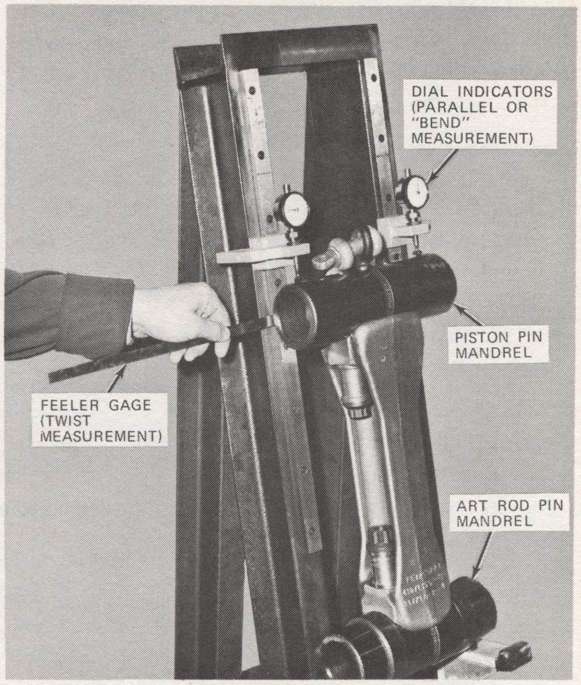

DIAL INDICATORS (PARALLEL OR "BEND" MEASUREMENT)
PISTON PIN MANDREL
FEELER GAGE (TWIST MEASUREMENT)
ART ROD PIN MANDREL

FIG. 10. CHECKING ART ROD ALIGNMENT.

FIG. 10, E-18849

2. The length of the throat area on the gage will depend on the diameter of the mandrels used. See Fig. 12.

Master Rod:

a. The minimum acceptable length of the master rod (after grinding) is 23.218 in. This distance is measured from the centerline of the connecting rod bearing bore to the centerline of the piston pin. When a master rod is installed in the alignment checking fixture, its length would be measured from the centerline of the piston pin mandrel to the centerline of the expanding crank mandrel.

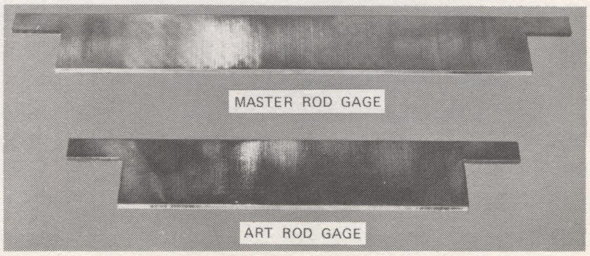


FIG. 11. ASSEMBLED GO/NO-GO GAGES.

FIG. 11, E-18850

FIG. 12, E-18851

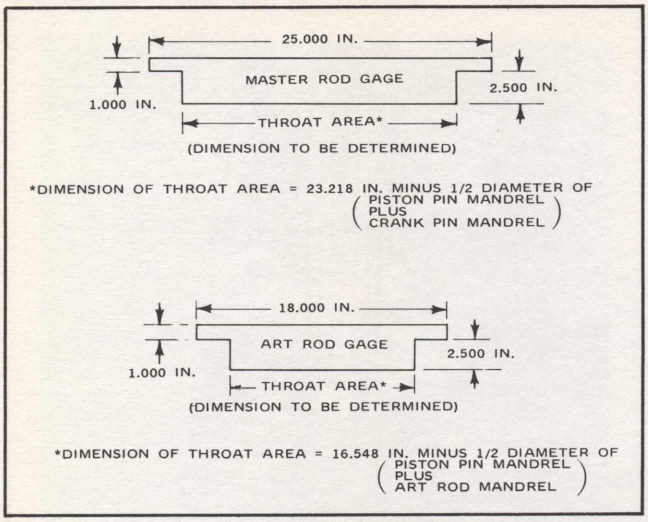

25.000 IN.
MASTER ROD GAGE
1.000 IN.
2.500 IN.
THROAT AREA*
(DIMENSION TO BE DETERMINED)
*DIMENSION OF THROAT AREA = 23.218 IN. MINUS 1/2 DIAMETER OF (PISTON PIN MANDREL PLUS CRANK PIN MANDREL)
18.000 IN.
ART ROD GAGE
1.000 IN.
2.500 IN.
THROAT AREA*
(DIMENSION TO BE DETERMINED)
*DIMENSION OF THROAT AREA = 16.548 IN. MINUS 1/2 DIAMETER OF (PISTON PIN MANDREL PLUS ART ROD MANDREL)

FIG. 12. GO/NO-GO GAGES, ASSEMBLY DIMENSIONS.

b. The purpose of the gage is to determine whether the rod is at least 23.218 in. Since the gage is inserted between the two mandrels, one-half the diameter of both mandrels must be subtracted from 23.218. This will then give the throat dimension of the gage.

c. All Part 147X1508 piston pin mandrels are 3.116 in. in diameter at the point where the dial indicators contact; however, the diameter of the expanding crank mandrels, Part 147X1506 (and the art rod pin mandrels, Part 147X1507), is 3.117 ± 0.010 in. at the point where the dial indicators contact. Therefore, the diameter of these mandrels can vary from 3.107 in. to 3.127 in. and must be accurately measured with a micrometer. Do not use 3.117 in. as the average diameter of these mandrels.

d. Example (using mandrel adapter kit, Part 147X1505):

Throat dimension of a gage C = 23.218 in. minus 1/2 diameter (piston pin mandrel A plus diameter expanding crank mandrel B)

Minimum acceptable master rod length		23.218 in.
Diam. piston pin mandrel A (always)	3.116	
Diam. crank mandrel B (from micrometer reading)	+3.118	
	$\frac{6.234}{2}$ =	
		−3.117 in.
Throat dimension of gage C		20.101 in.

Articulated Rod:

The throat dimension of the gage for the articulated rod is obtained in the same manner as that for the master rod, except that the minimum acceptable length of an articulated rod after grinding is 16.548 in.

Example (using mandrel adapter kit, Part 147X1505):

Throat dimension of a gage F = 16.548 in. minus 1/2 diameter (piston pin mandrel D plus diameter art rod pin mandrel E)

Minimum acceptable art rod length		16.548 in.
Diam. piston pin mandrel D (always)	3.116	
Diam. art rod pin mandrel E (from micrometer reading)	+3.114	
	$\frac{6.230}{2}$ =	
		−3.115 in.
Throat dimension of gage F		13.433 in.

3. With a bent and/or twisted rod in the fixture:

Place the gage between the mandrels as close as possible to the rod, first on one side of the rod and then the other. Be sure to use the smaller, outside diameter of the art rod pin mandrel. See Figs. 13 and 14.

If the gage fits between the mandrels on both sides of the rod, out to the ends of the mandrels, the rod is repairable.

If the gage fits tightly toward the ends of the mandrels or cannot be inserted between the mandrels, on either side of the rod, the rod must be scrapped.

4. Once assembled, a pair of gages may be used with any master or art rod. However, a pair of gages and the piston pin, art rod pin, and expanding crank mandrels for which the gages were made, must be kept together as a set. Important dimensions should be inscribed on their surfaces.

NOTE: *If a shop uses more than one set of mandrels, a set of gages must be made for each set of mandrels. Gages and mandrels should be identified so that pieces from one set will not be used with pieces from another set. This will result in false readings.*

FIG. 13, E-18852

FIG. 14, E-18853

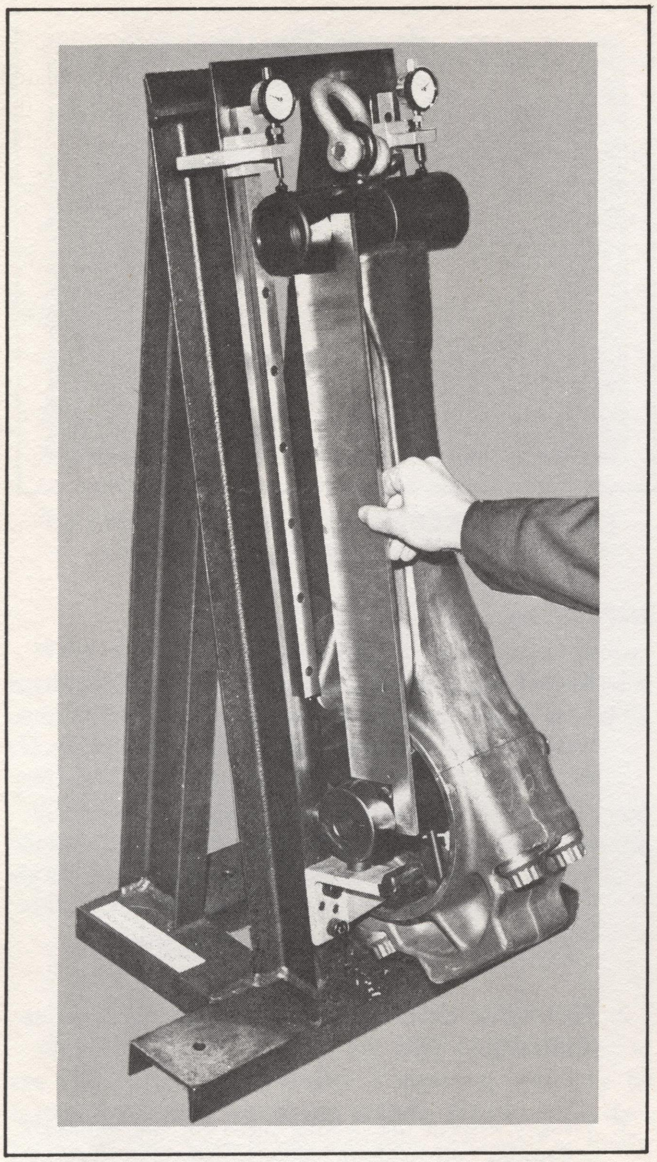


FIG. 13. CHECKING MASTER ROD LENGTH.

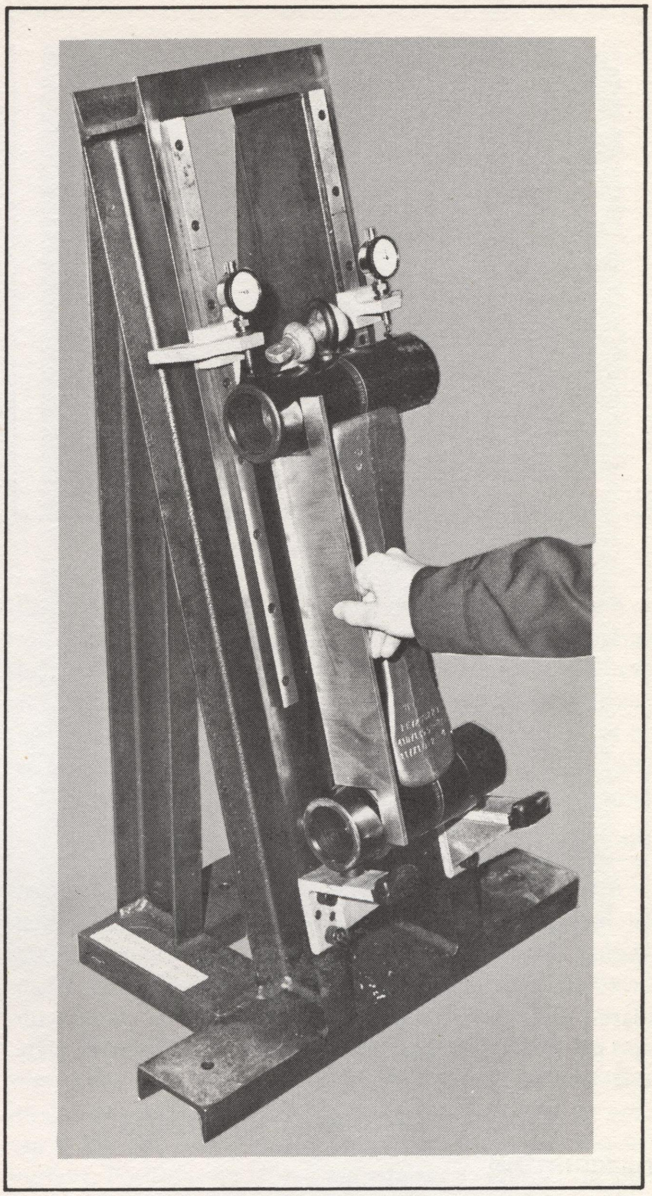


FIG. 14. CHECKING ART ROD LENGTH.

Gages should be stored in a safe place away from heat, moisture, and corrosive materials and should be protected from abrasion.

Connecting Rod Thrust Surfaces

Connecting rod thrust surfaces, shown in Fig. 15, were tinned on earlier connecting rods. This is no longer considered necessary and need not be continued, unless necessary to bring clearance at thrust faces within limits in DATA section.

Inspection

Visually inspect the tinned thrust surfaces for wear and for separation of the tin from the rod. The coating should be renewed if it is worn through to steel in any area or if it has separated from the rod.

Building Up Thrust Surfaces

The thrust surfaces can be retinned, using a lead-tin solder made up of 60 percent tin, 40 percent lead. For convenience of application, the solder should be in the form of a solid wire of 1/8-in. diameter. See Fig. 15. A good soldering flux, either liquid or paste, should be used to clean the surfaces and cause the solder to flow evenly. To melt the solder, a gas torch or a soldering iron of sufficient heating capacity should be used.

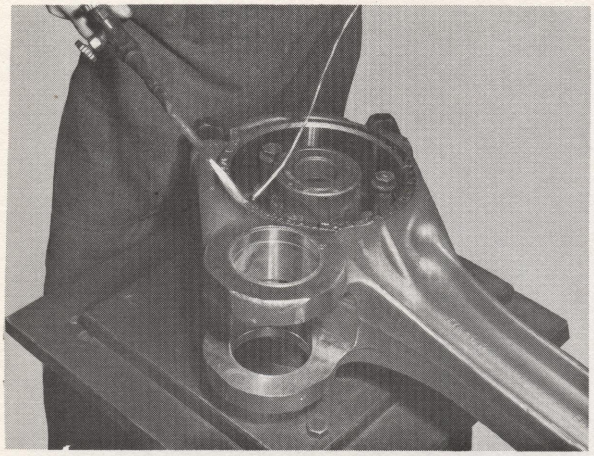


FIG. 15. BUILDING UP THRUST SURFACES.

Before attempting to apply the solder, make sure all surfaces to be plated have been thoroughly cleaned and are dry. Apply flux to the surfaces first, then the solder, and heat. "Puddle" solder as it is fed onto the surface, causing it to build up by moving the torch or iron to control heating. During the process, try to maintain the solder thickness as uniform as possible.

Finishing Thrust Surfaces

After tin has been added to the thrust surfaces, it must be machined or filed to a uniform thickness. When total plating thickness at both surfaces does not exceed 0.004 in. (0,102 mm), plating on one side only is allowed. When plating exceeds 0.004 in., both sides must be plated with no more than 0.004 in. difference in finished plate thickness between sides.

CONNECTING ROD BEARINGS

DESCRIPTION

The connecting rod bearing shells, shown in Fig. 16, are precision-type and are replaceable without machining or scraping. They are constructed with a solid steel back which is plated on the running surface with specially formulated bearing metals. Each shell has a locating tab which properly locates and secures it in position in the rod or in the cap. Any shell may be applied in either position, as shells are interchangeable. Each bearing shell is stamped along its radial edge with a serial number, a part number and a catalog number.

CAUTION: *The locating tab slot is on one side only of the rod and the rod cap. The tab on the shell must be positioned in the slot, or it will be crushed in and cause a bearing failure and, possibly, further serious damage.*

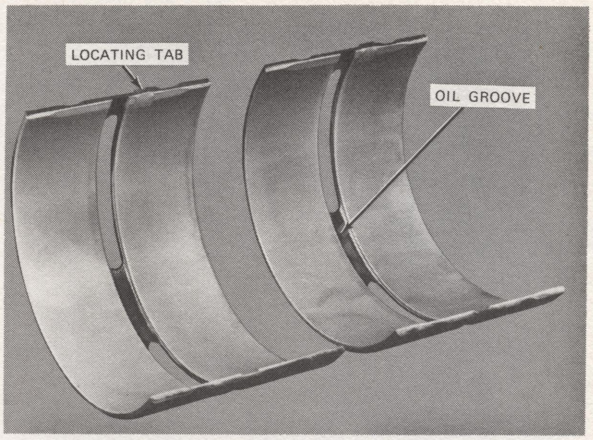


FIG. 16. CONNECTING ROD BEARING SHELLS (CURRENT STYLE).

INSPECTION

1. Record the exact location of the bearing shell when removing it from the engine. This may be done by using the bearing serial number and its rod number. If the serial number is difficult to read, locating information may be scribed in the center web of the oil groove. Bearing shells with short mileage and which, on inspection, are found to be in good condition may be reused if returned to their exact original position in the same rod or cap.

2. Thoroughly clean and dry the bearing shells before inspecting.

3. Visually inspect the bearing shells for the following conditions, particularly with a view to locating sources of any troubles:

    a. Scores or gouges in bearing metal – a few minor scores, if metal is not upset each side of the score, may be tolerated; otherwise, discard the shells. Examine the crank pin for possible cause of damage (dirt, metallic particles, etc.).

    b. Build-up of dirt in parting line relief – remove carefully. If hard dirt or metallic particles are imbedded in the soft metal bearing surface, discard the shell. Check for source of foreign material.

    c. Distortion or other apparent damage to shell – discard.

    d. Bearings worn through to bronze – discard.

FIG. 15, E-11874

FIG. 16, E-16540

FIG. 17, E-16127

e. Bearing metal missing – bearing metal may be flaked out off the steel back due to erosion, corrosion, fatigue, local heating, etc. Discard.

In general, the replacement of precision bearings in engine sets at safe mileage intervals, as determined by experience, is good practice for engines in heavy-duty service.

INSTALLING CONNECTING ROD BEARINGS

NOTE: *The high-crush bearing shell is now being furnished as a replacement part and is also being used in current-production engines. Do not intermix one high-crush bearing shell with one of the former bearing shells in the same rod assembly.*

When installing bearing shells, to assure their proper seating, assure the back surfaces are clean and free of nicks or burrs. If nicks or burrs are found, the surfaces should be smoothed by using a fine mill file or oil stone.

After assembling the bearing shells and cap in place, and before tightening the cap bolts, verify the lock tabs on the shells are still properly positioned.

INSTALLING RODS AND PISTONS IN ENGINE

Place the master rod in the left bank and the art rod in the right bank of the engine. Connecting rods may be installed with their piston and cylinder preassembled, then placed on the engine in one operation (preferred method), or with piston attached or, if necessary, separately.

When installing rods separately or with their piston attached, the crankshaft will require positioning to permit the piston to rest on the piston support bar during cylinder installation.

Just prior to assembly, the piston pin bushing, art rod pin bushing and the crankpin should be coated with a film of clean engine lube oil. Coat the threads and washer face of the pin bolts and rod cap bolts with a lubricant, as specified in the DATA section. Refer to the DATA section for torque values and tightening procedure for the pin bolts and rod cap bolts.

NOTE: *When installing the pin bolt spacers, keep the flat end of the spacer mating with the washer face on the pin bolt.*

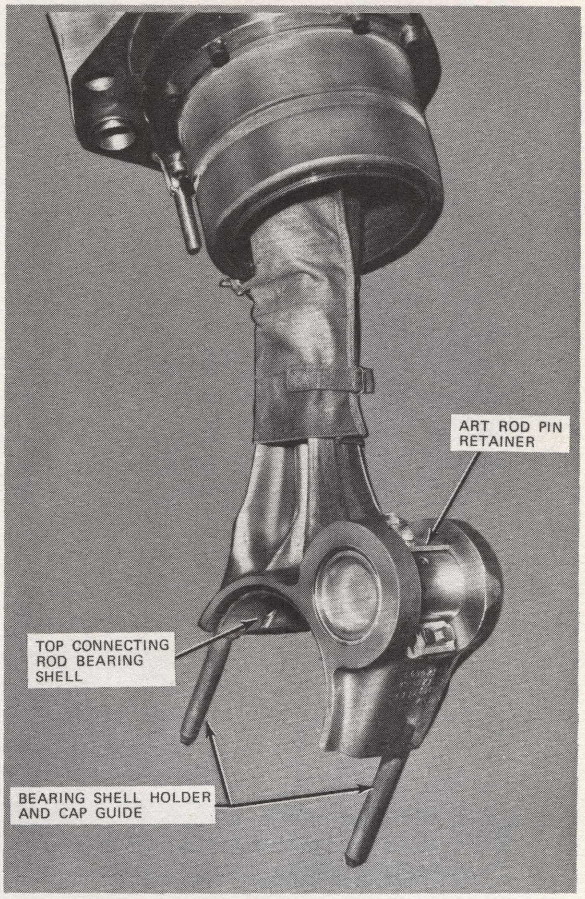

ART ROD PIN RETAINER
TOP CONNECTING ROD BEARING SHELL
BEARING SHELL HOLDER AND CAP GUIDE

FIG. 17. ROD INSTALLATION TOOLS.

To install the master rod in the engine, position the top connecting rod bearing shell in the bearing bore of the master rod, and secure it with two bearing shell holder and cap guide pins. See Fig. 17. Insert the art rod pin into its bushing. Position the art rod pin retainer to prevent the pin from sliding out of its bushing during master rod installation. Lift the master rod with a suitable hoist, so it may be lowered through the cylinder bore in the main frame. Carefully guide it onto the crankpin. Remove the slip washers from the guide pins. Install the master rod cap, with the lower connecting rod bearing shell in position. Secure the cap with two bolts. Remove the guide pins and install the remaining two bolts. Tighten as specified in the DATA section. If the rod is in place, position the piston to its rod and secure the piston pin with two bolts and spacers. See instructions on PISTONS for piston ring installation. Tighten as specified in the DATA section. Install the cylinder assembly. See instructions on CYLINDERS.

Remove the art rod pin retainer. Lower the art rod through its cylinder bore into position on the art rod pin. Install the art rod pin bolts and spacers. Tighten as specified in the DATA section.

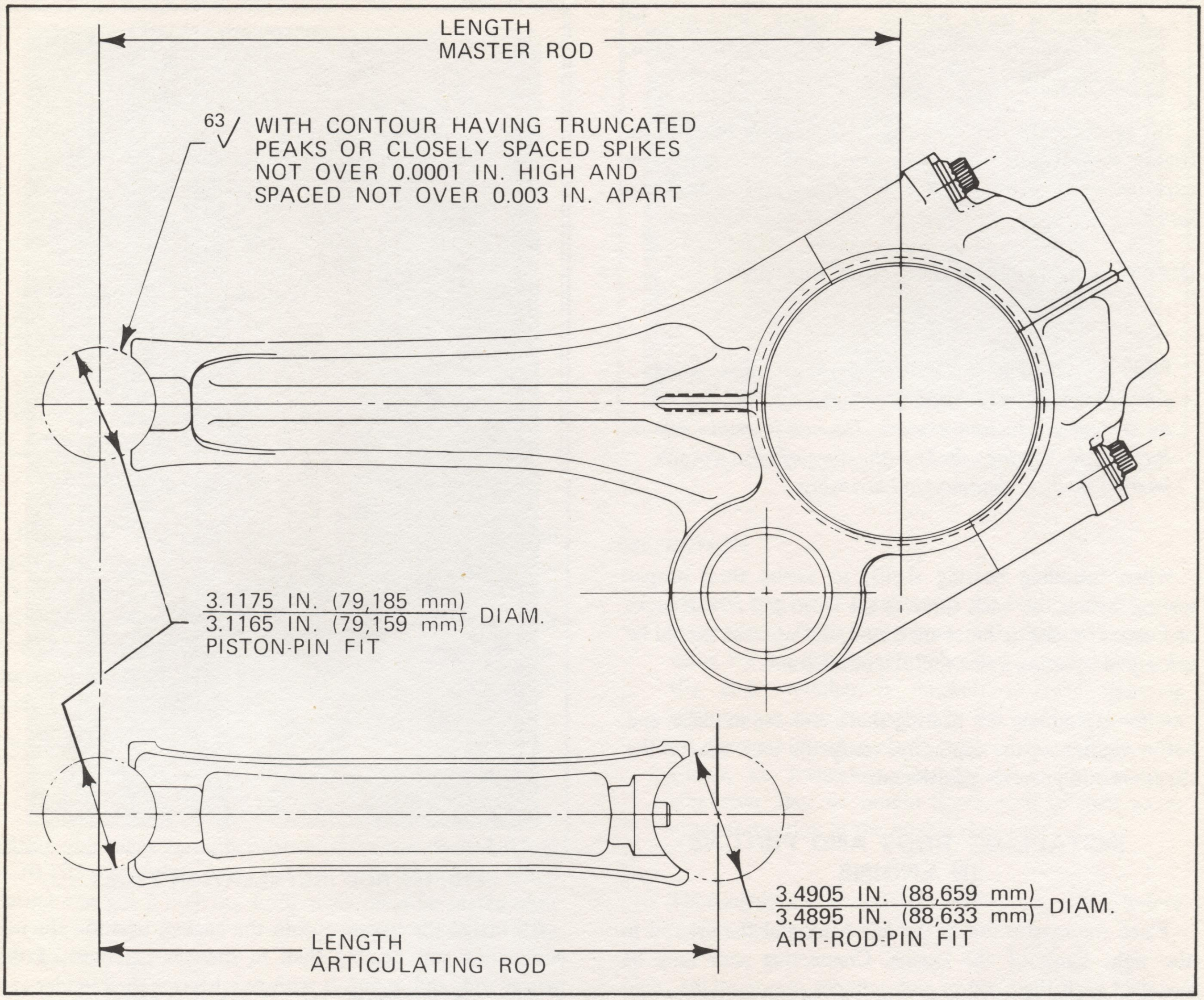

LENGTH
MASTER ROD
63
WITH CONTOUR HAVING TRUNCATED PEAKS OR CLOSELY SPACED SPIKES NOT OVER 0.0001 IN. HIGH AND SPACED NOT OVER 0.003 IN. APART
3.1175 IN. (79,185 mm)
3.1165 IN. (79,159 mm) DIAM.
PISTON-PIN FIT
3.4905 IN. (88,659 mm)
3.4895 IN. (88,633 mm) DIAM.
ART-ROD-PIN FIT
LENGTH
ARTICULATING ROD

FIG. 18. MEASURING CONNECTING ROD LENGTHS.

FIG. 18, E-24681

DATA

	Minimum New		Maximum New		Worn Limit	
	In.	mm	In.	mm	In.	mm
MASTER CONNECTING ROD						
Total side clearance, rod to crankshaft	0.015	0,381	0.030	0,762	0.055	1,397
Width between thrust surfaces	5.975	151,765	5.985	152,019	5.975	151,765
Bore for connecting rod bearing, with cap bolts tightened to specified torque (see note "a")	7.8745	200,01	7.8755	200,04	7.8765	200,06
Connecting-rod bearing bore, shells assembled in rod and cap bolts tightened to specified torque (see note "a")	7.441	189,00	7.4453	189,11	See note "f"	
Connecting-rod bearing bore out-of-round limit, shells assembled in rod and cap bolts tightened to specified torque	–	–	0.003	0,076	See note "f"	
Art rod pin bushing bore, in master rod	3.875	98,425	3.876	98,450	3.8765	98,463
Art rod pin bushing bore out-of-round limit	–	–	–	–	0.001	0,025
Art rod pin bushing to master rod bore, interference fit	0.002	0,051	0.0035	0,089	0.0015	0,038
Art rod pin diameter	3.4955	88,786	3.4965	88,811	3.4935	88,735
Art rod pin to bushing, running clearance (see note "b")	0.003	0,076	0.006	0,152	0.0085	0,216
Art rod pin bushing bore (free state)	3.504	89,002	3.505	89,027	–	–
Rod length, measured from the centerline of the connecting rod bearing bore to the centerline of the piston pin (see Fig. 18)	23.243	590,37	23.252	590,60	23.218	589,74

	MAXIMUM DEVIATIONS FROM ZERO (For rods to be continued in service)	
Rod Alignment	In. per ft. of length along mandrels (See Note "c")	Actual inches measured in checking fixture with rails 8 in. apart
Parallel (Sidewise Bending)		
Piston-pin centerline to crankpin-bore centerline	0.007†	0.004†
Art-pin bore centerline to crankpin-bore centerline	0.004	0.0027
Twist		
Piston-pin centerline to crankpin-bore centerline	0.007	0.004
Art-pin bore centerline to crankpin-bore centerline	0.004	0.0027

	Minimum New		Maximum New		Worn Limit	
	In.	mm	In.	mm	In.	mm
ARTICULATING ROD						
Clearance between art-rod pin and bushing clamp	0.010	0,254	–	–	–	–
Total side clearance of art rod in window of master rod	0.004	0,102	0.023	0,584	0.036	0,914
Rod length, measured from the centerline of the art rod pin to the centerline of the piston pin (see Fig. 18)	16.573	420,95	16.582	421,18	16.548	420,32

†Sum of the readings of the two dial indicators; e.g., –0.003 on one indicator and +0.004 on the other indicator gives a total of 0.007.

DATA (Cont'd.)

ARTICULATING ROD (Cont'd.)	MAXIMUM DEVIATIONS FROM ZERO (For rods to be continued in service)	
	In. per ft. of length along mandrels (See Note "c")	Actual inches measured in checking fixture with rails 8 in. apart
Rod Alignment		
Parallel (Sidewise Bending)		
Piston-pin centerline to art-pin-bore centerline	0.004†	0.0027†
Twist		
Piston-pin centerline to art-pin-bore centerline	0.004	0.0027

CONNECTING-ROD BEARING	Minimum		Maximum		Wear Limit	
	In.	mm	In.	mm	In.	mm
Running Clearance (high crush – Part 117X1045)	0.0037	0,094	0.0089	0,226	0.0089	0,226
Running Clearance (new high crush with thin overlay – Part 117X1045-1 and -2)	0.0031	0,079	0.0083	0,211	0.0083	0,211

TORQUE VALUES	lb.-ft.	N·m
Master connecting-rod cap bolt (see Notes "d" and "e")	400-420	542-569
Master connecting-rod cap nut (used on older rods with studs)	450-470	610-637
Master rods with studs – torque studs	200	271
Art-rod pin bushing clamping bolts	35-40	47-54
Art-rod pin bolts (see Notes "d", "e" and "g")	450/375	610/508
Piston-pin bolts (see Notes "d", "e" and "g")	400/250	542/339

†Sum of the readings of the two dial indicators; e.g., –0.003 on one indicator and +0.004 on the other indicator gives a total of 0.007.

NOTES

a. Average of three readings taken normal to the split line and 1-1/2 in. each side of the split line and taken approximately 3/4 in. from face of rod. Take readings at both ends of rod.

b. Check by using a 3.4965/3.4963 in. (88,811/88,806 mm) diameter pin and a 1/2-in. wide feeler gage inserted 2 in.

c. Parallel and twist measurements are given in "thousandths per foot of length". This means the difference in distance between two, one-foot-long mandrels when measured first at one end of the mandrels and then at the other. If the mandrels are shorter, the actual difference must be proportionately reduced; i.e., 0.006 in. per ft. of length becomes 0.004 in. actual if the mandrels are only 8 in. long.

d. Tighten alternately in increments of 100-125 lb.-ft. (136-170 N·m) to the final torque value.

e. Check that the mating threads are in good condition and are clean. Coat the threads and washer faces on the bolts with MOLYKOTE G-n*, Part 147X1143-1.

f. For worn limit of bearing shells, refer to CRANKSHAFT AND MAIN BEARINGS under Tab DE-4.

g. Torque bolts to the higher value, loosen bolts, then re-torque to the lower value.

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*Product of Dow Corning Corp.